

November 27, 1956

Influency of frequency of sifting, holding temperature,
and concentration on pupation of screw-worm larvae

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During several conferences regarding the screw-worm research Dr. Knipling mentioned the possible harmful effects of frequent sifting of larvae as would probably occur during large-scale production and irradiation for the Florida screw-worm eradication program. Subsequently tests were conducted to evaluate the effects of sifting, holding temperatures, and concentration of larvae during the pupation period. Data from these tests are tabulated below:

Number and percent larvae pupating and percent emergency of pupae when separation of larvae from pupae was made at indicated intervals.
(Holding temperature 80° F.) :

:Separation: :				
Group:	intertals:	Number	:Percent	: Percent
	:in hours	:of pupae	:pupating	:emergence
1	0-6	2042	54	95.7
	7-12	1140	30	93.7
	13-24	570	15	91.9
2	0-12	3372	84	97.3
	13-24	665	16	92.3
3	0-24	4083	99	94.3

Number and percent larvae pupating at indicated intervals and percent emergence of pupae when larvae were held at indicated temperatures:

:Pupation: :				
Temperature:	interval:	Number	:Percent	: Percent
in F.°	:in hours	:of pupae	:pupating	:emergence
58	0-72	2042	99	90.1
80	0-12	1710	86	94.7
	13-24	285	14	96.9
97	0-12	1995	93	92.0
	13-24	142	7	25.9

Percent emergence of pupae from larvae when the indicated numbers were held in pint jars:

<u>: Number : Percent</u> <u>Group :of pupae:emergence</u>		
1	475	96.9
2	997	95.6
3	1330	94.6

Larvae used in these tests were from a single culture reared in a large tray heated from below. Approximately 30% of the larvae had pupated when a separation was made to obtain larvae from these tests.

Three groups of approximately 4,000 larvae each, held in 12" diameter enamel pans and covered with a 2" layer of sand, were used in the sifting test. In group 1 pupae were separated from the remaining larvae at the end of 6, 12, and 24 hours compared to a separation at 12 and 24 hours for group 2. Group 3 was sifted at the end of 24 hours when pupation was over 99% complete. At the end of 12 hours 84% of the larvae in groups 1 and 2 had pupated, indicating no delay in pupation due to the additional sifting operation for group 1. Emergence in all groups was uniformly good.

In the test to evaluate the effects of various temperatures on pupation approximately 2,000 larvae were held in an identical manner to the sifting test except for the variations in temperature. Larvae held at 58° F. did not complete pupation until the end of 72 hours compared to 24 hours for those held at 80° F. Larvae held at 97° F. pupated more rapidly than those held at 80° F. but emergence of pupae from larvae requiring longer than 12 hours to pupate at 97° F. was seriously reduced, with the percent emergence being only 25.9% compared to 96.9% for the group held at 80° F. Pupae that had formed at the end of 12 hours at 97° F. were removed at this time to 80° F. and emerged 94.7%. This demonstration of the detrimental effect of prolonged high pupal holding temperatures verifies previous observations when larvae were reared and held during pupation in heated rooms. Under these conditions emergence of pupae was commonly as low as 70%.

Only a limited number of larvae were available for the concentration test. Groups of 475, 997, and 1,330 larvae were placed in pint jars 3" in diameter. All groups appeared to pupate normally and emergence was uniformly good. However, previous laboratory observations indicate that when larvae were placed in trays to a depth greater than 1" the sand became too moist for ease of sifting, very strong ammonia odors emanated, a temperature rise occurred and a small percent of the pupae showed abnormal coloration. Further work on the optimum concentration of larvae is needed.

